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Misc. Inc. Letter
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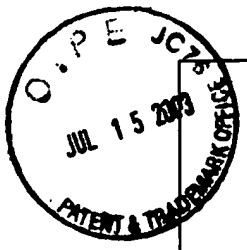


IN THE UNITED STATES PATENT AND TRADEMARK OFFICE		
	Application No.	10/024,475
	Filing Date	December 21, 2001
	First Named Inventor	Chan-ho PARK
	Group Art Unit	2811
	Examiner Name	Im, Junghwa M.
	Attorney Docket No.	1751-294

Title of the Invention: **HIGH VOLTAGE SEMICONDUCTOR DEVICE HAVING HIGH BREAKDOWN VOLTAGE AND METHOD OF FABRICATING THE SAME**

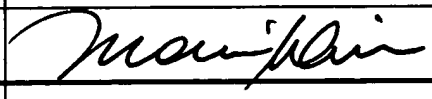
REQUEST FOR PERSONAL INTERVIEW

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Dear Sir:

Applicant respectfully requests the courtesy and favor of a personal interview with the Examiner at the Patent and Trademark Office to discuss the patentability of the claims. A face-to-face interview, it is submitted, would be far more efficient and effective than a telephone interview in view of the ability to propose, counter-propose, revise, and finally come to an agreement in a highly interactive fashion.

Please find enclosed proposed arguments to be discussed during the personal interview.

RESPECTFULLY SUBMITTED,					
NAME AND REG. NUMBER	Monica S. Davis, Registration No. 44,492				
SIGNATURE			DATE	July 15, 2003	
Address	Rothwell, Figg, Ernst & Manbeck 1425 K Street, N.W., Suite 800				
City	Washington	*State*	D.C.	*Zip Code*	20005
Country	U.S.A.	*Telephone*	202-783-6040	*Fax*	202-783-6031

Enclosure

PROPOSED ARGUMENT FOR PERSONAL INTERVIEW (10/024,475)

Claim 1:

- A base area having a "trench which penetrates the low concentration collector area in a vertical direction at a junction termination," "wherein the depth of the trench is 50-150 μm."
- The trench is applied to a high voltage power discrete device, and is positioned at a "junction termination."
- The trench only penetrates the p base region. → ? where in claim
- The depth of the trench is "50-150 μm."

El-Kareh (differences):

- The trench is applied to a general IC structure, and is positioned in an active cell.
- The trench penetrates the p base region and n+ emitter region.
- The depth of the trench is several μm.

MacDonald (differences): → Addison actually could use OP. Page

- Non-analogous prior art.
- Relates to a trench-filling etch-masking microfabrication technique.
- This trench is not analogous to the trench of claim 1. "The first step ... is to etch deep trenches in a silicon wafer ... with the depth of the trenches equal to the desired height of the oxide mask (e.g., 100 microns).
- The trench is 100 microns and NOT in the range of 50-150 μm.

El-Kareh in combination with MacDonald:

- The combination of the references do not teach or disclose the invention of claim 1 because all the limitations have not been satisfied as discussed above.
- The combined disclosures of El-Kareh and MacDonald do not render the claims obvious because there is no motivation, absent the hindsight reconstruction of the present invention, to modify the disclosure of El-Kareh in accordance with the disclosure of MacDonald.
- It is suggested in the Office Action that it would have been obvious to a person of ordinary skill "incorporate the teaching of MacDonald to the trench of El-Karen's device since a device with such a deep trench conforms the current trend in microstructure designs." → not in ↓ claim
- a) What does this mean (e.g., such deep trench conforms the current trend in microstructure designs?
- b) Is current being defined as "at the time of the invention"?
- c) What does this rationale have to do with the invention of claim 1?
- d) This rationale is not suggested anywhere in the applied references; it is no more than a hindsight reliance on the teachings in the present application.

?? Not in claim?

The current effort of the present invention is to reduce the concentration of an electric field at a cylindrical junction or, in the alternative, prevent a strong electric field from being generated at the end of a high voltage device. This is not taught in either reference.

As discussed in the amendment filed March 4, 2003, equipment becomes larger in size and capacity, high voltage semiconductor devices having a high breakdown voltage, a high current and a fast switching speed become more important. In order to decrease power loss in a conductive state even while a large amount of current is flowing, the saturation voltage of high voltage semiconductor devices is required to be low. High voltage semiconductor devices are fundamentally required to have a characteristic of resisting a reverse high voltage applied to both ends thereof in an off-state or at the moment the device is turned off. That is, high voltage semiconductor devices are fundamentally required to have a high breakdown voltage. A variety of breakdown voltages of power semiconductor devices are required to be in a range from several tens of volts to several thousands of volts.

Generally, the breakdown voltage of a semiconductor device largely depends on a depletion region extending from a PN junction, and particularly, is greatly influenced by the curvature of the depletion region. In particular, for a planar junction, an electric field is concentrated on the edges, which have a large curvature, thereby decreasing the overall breakdown voltage. Accordingly, a number of methods have been proposed in order to obtain high breakdown voltage by preventing an electric field from being concentrated on the edge of a junction.

The present invention accomplishes the above by utilizing a high voltage semiconductor device having a trench with a width that is 1/10 times the depth of the trench. The shape of the depletion area varies depending on the width of the trench, and the breakdown voltage property varies depending on the shape of the depletion area.

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